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(54) **Electronic key release device**

(57) An electronic key incorporates an electronic chip 3 which has a two terminal output 4, 5. The key is received in a slot having a two wire contact connected to a control circuit which will release the lock. The head of the key is recessed to receive the chip and the shank carries two conductive areas connected to the terminals. A recess in the shank can receive a retaining bolt.

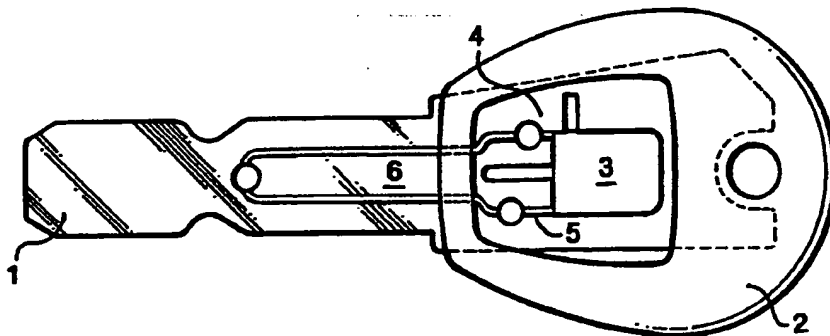
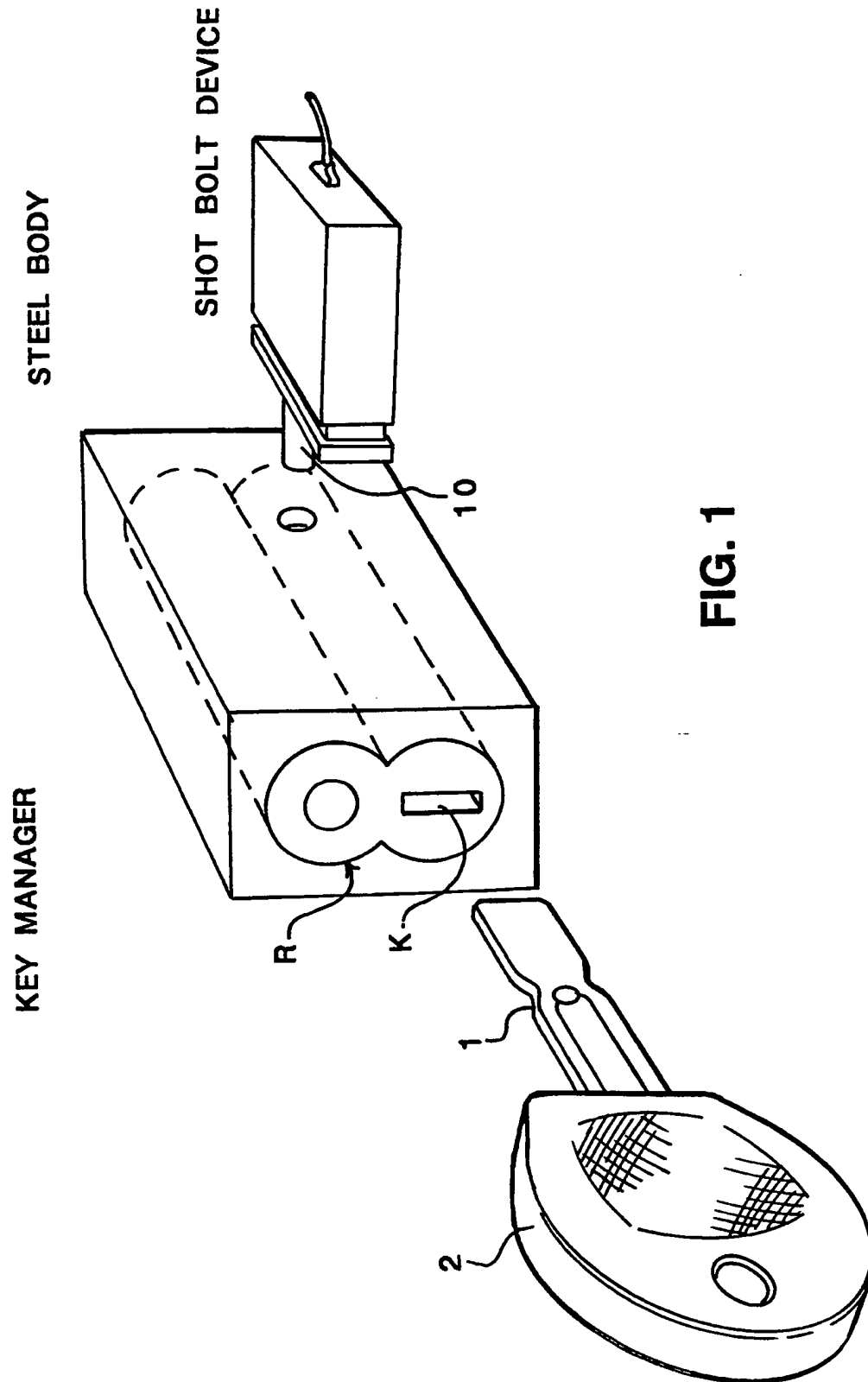


FIG. 2A

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995



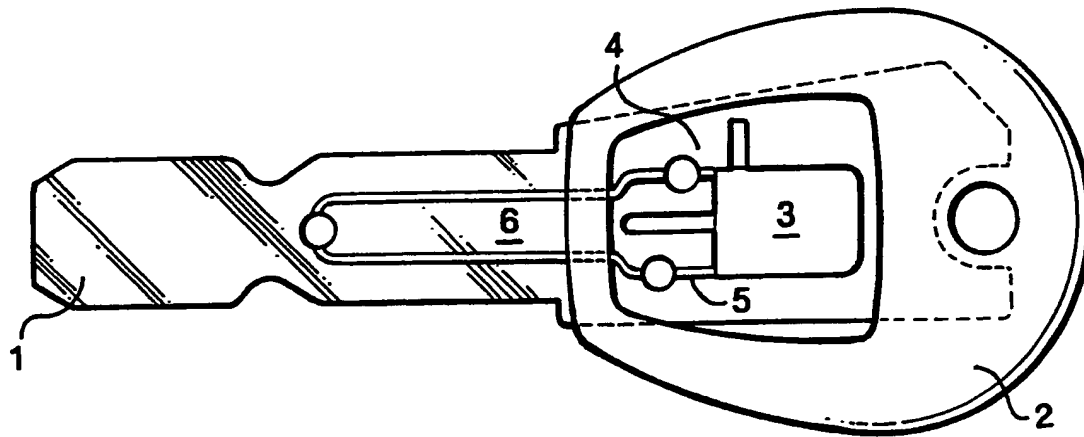


FIG. 2A

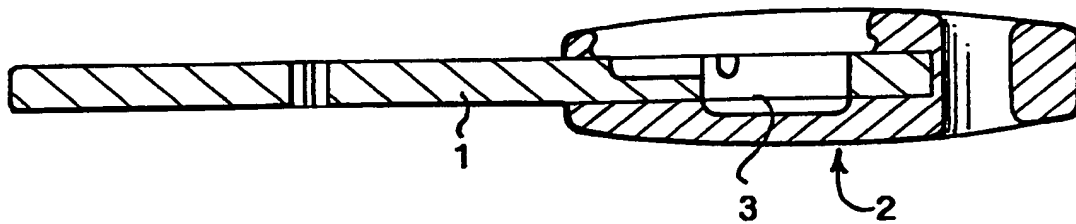


FIG. 2B

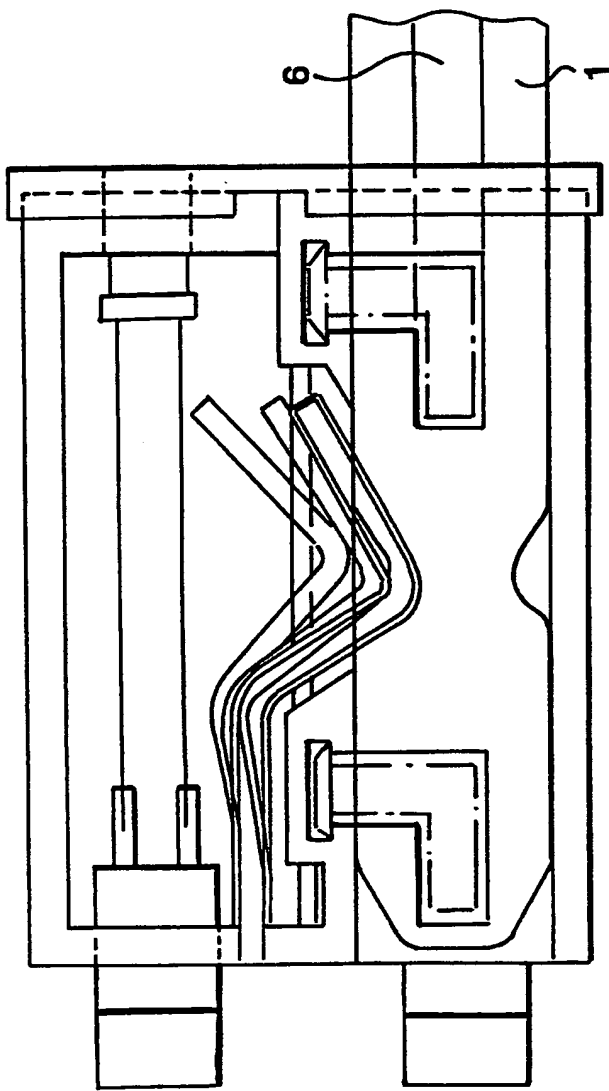


FIG. 3

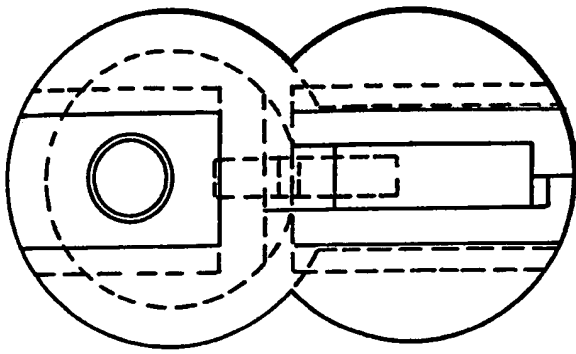


FIG. 4

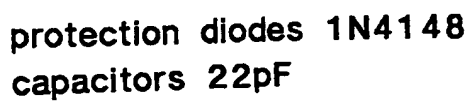
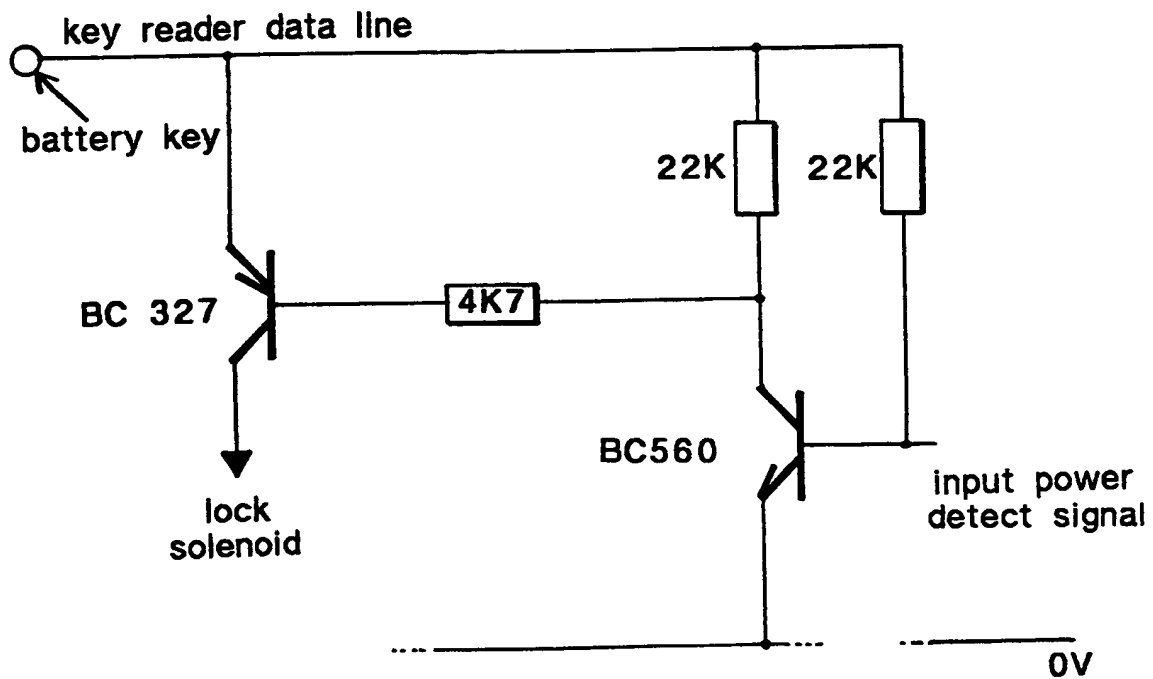


FIG. 6



ELECTRONIC KEY AND READER

The invention relates to an electronic key and a key reader therefor. Such a reader may be incorporated in a wide variety of equipment, including a keyhole, a console or the like. Applications of the key and reader of the invention include:

arming, disarming and general control of a security system

setting environmental parameters such as mood lighting or air conditioning in buildings

access control and control of locks

monitoring the functions of installed systems for maintenance or troubleshooting

sending data for example E-mail to a central computer, for example engineers' inspection findings, or housekeeping messages in an industrial, commercial, leisure or like environment;

sending fixed information, such as guard tour way-point confirmation or distress calls; and

management of keys, generally by using a key of the invention with a device or demand cabinet

It is one object to provide an aesthetically pleasing, easily handleable electronic key.

It is another object of the invention to provide a discreet, secure and tamper-

resistant key reader that can be aesthetically pleasing in its own right, or can be made to blend unobtrusively into any decor. It is a further object to provide a key reader and a key for use with an electric or electronic lock whereby the key has the capability of sending to the control unit a unique digitally coded signal serving to release or secure the lock or like device.

In a first aspect of the invention there is provided an electronic key for actuating a release device, wherein the body of the key incorporates an electronic chip which, on activation, is capable of transmitting a stream of digital data through a two-wire contact in order to release or activate the lock, via a control system.

Preferably the key body has a handle portion and an elongate shank portion, and the chip is mounted in the handle portion. Most preferably the chip is mounted in a plastics carrier which is received in a hole in the thickness of the handle.

In a much preferred feature of the key the chip is suspended in a plastics or like carrier which is received in a hole therefor and extends across the thickness of the key handle or fob. This has the advantage of avoiding the need to pot or heat treat the chip (which can be damaged thereby) and also does not mar the aesthetic appearance of the key. The shank has two spaced apart contact zones to make electrical contact with contacts in the reader device, which contacts are incorporated in a control circuit. It is a much preferred feature that a portion of the shank is shaped to engage a shut bolt location device. In such a case the key way includes a socket to receive a shotbolt and the key has a corresponding recess through which the shotbolt passes, and the control circuit is arranged so that the key cannot be withdrawn unless an authorisation code is inputted.

In a second aspect of the invention there is provided a lock device which is releasable, subsequent to a signal, the result of a valid data stream and used in

combination with a key device incorporating a chip which includes a pre-programmed memory and whereby the data stream may be transmitted through a conductive medium to the lock.

In a more specific second aspect there is provided a key reader for use with a key as defined, the reader comprising a keyway to receive the shank of the key and two contacts to make electrical contact with the contacts of the key, the reader being incorporated in a control circuit arranged to authorise a key and to record use of the key and/or the reader. Preferably the reader includes a deformation, e.g. a slot or hole shaped to receive a shotbolt.

In a third aspect the invention provides a key reader as defined including a battery key pass facility to allow actuation of the received key in the event of a power failure.

Most preferably this invention is implemented by use of a so-called "touch" memory chip being a series of semiconductor chip devices manufactured by Dallas Semiconductors. These devices incorporate a memory which may be pre-programmed and in which the contents of the memory may be transmitted via a one-touch wire serving to pull down a signal which can thereby cause a unique digital code to be sent.

In one preferred aspect of the invention a key and a lock combination comprises three separate components as follows:

a) The Key

This unit consists of a plastics body shaped to have an elongate shank with metal contact zones and a head wherein there is a hole to receive a plastic moulding which encapsulates the base chip from the Dallas Touch range.

The key can be inserted either way up and will be read by the reader (see key reader).

b) The Key Reader

This unit consists of a plastic flame proof socket, housing two contact parts, e.g. wings,, a tricolour light emitting diode and a four pole connector. This unit has a dove-tailed front which mates with a brass (or similar metal) front piece, to cover the reader housing and appears as a conventional key core front piece.

The reader is designed to accept a DC voltage of up to 50 Vdc such that the complete door control unit may be supplied with the necessary running voltage in an emergency. The key reader provides two-way half-duplex communication using two wires: data and ground. It is intended for connection to a microcontroller, utilising one input data signal and one output clock signal from the controller. The input circuit of the microcontroller includes protection against electrostatic discharge via the key and other sources of potentially damaging electrical interference. The electrical signals are TTL and 5V CMOS compatible, and employ a data rate of say 9,600 Baud.

In the case of an electro-mechanical lock, the input includes an additional circuit to open the lock with a special 'battery key' if power to the microcontroller fails. To maintain security integrity, the battery key bypass facility is disabled except in the case of total power failure, (necessarily including battery backup failure). In these circumstances the bypass facility is mandatory to conform with safety regulations.

In a specific aspect the invention provides a reader device having an elongated parallel sided keyway to receive a key as defined, the keyway having two longitudinal spaced apart contacts in electrical communication with a control circuit, the key being flat and having an elongate shank having two spaced apart contact zones which are arranged to contact the contacts of the keyway, and a reader as defined in which one contact completes a ground or earth circuit and the other contact completes a data carrying circuit.

Preferably the reader is installed in a door of a room of a multi room building, e.g. a hotel and arranged to activate heating, cooling or lighting switches for the intended occupant once the key has been formatted with an authorisation code.

The invention is further and briefly described with reference to the accompanying drawings, wherein:

Figure 1 is a perspective view of a lock including a reader and key of the invention

Figure 2A is a side elevation of a key parts being shown in section, and

Figure 2B is a longitudinal section;

Figure 3 is a longitudinal section through a keyway of a key reader;

Figure 4 shows the key and key reader in side section, transverse section and end elevation;

Figure 5 is a circuit of the data connection to a microcontroller; and

Figure 6 is a circuit for the battery key for use in the event of a total power failure.

The electronic key device comprises a metal key tongue 1 which is integrally connected to a plastic insulating key head 2 embodying a so-called Dallas chip 3 which is electrically connected by two wires 4 and 5 with the wire 5 connected to the metal tongue 1 and the wire 4 connected to a separate and insulated metal contact 6. With this arrangement, the chip can be caused to send a unique digitally coded signal through wires 4 and 5 and metal contacts 6 and 1 to a lock in order to release same.

The key reader R and associated electronics are compatible with the 'Dallas Touch Memory' technology, for example the DS2400 Silicon Serial Number. With the appropriate software in the microcontroller to implement the Touch Memory protocol instead of the general communications protocol described above, an Access Control system can be implemented based on keys with embedded touch memory chips.

The micro chip 3 is housed within the key fob with its respective connecting legs attached to two separate parts of the key. The two parts of the metal key act as the transmission medium for the chip, thus allowing data to be transmitted or received. As shown in Figure 1, the reader device R includes a keyway K having spaced apart electrical contacts to contact those of the key 1. A shotbolt device 10 is located to one side of the housing for the keyway K.

An external device plugged into the key reader and wishing to establish communication with the system initiates the following sequence. The communication protocol uses 8-bit bytes and is similar to the standard RS232 communication protocol.

1. external device sends an ENQ character (Enquire, code 5)
2. system responds with an ACK character (Acknowledge, code 6)
3. external device sends STX (start of text, code 2)
4. external device sends the message
5. external device sends ETX (End of text, code 3)
6. external device sends 16-bit CRC (Cyclic Redundancy Check)
7. system responds with:
 - ACK if no errors were detected
 - NAK (Negative Acknowledge, code 21) if the protocol failed.

Once communication with the system is established, messages can sent in either direction, utilising a mirror of the above protocol for messages from the system to the external device.

Because the overall system is integrated yet versatile, it can offer the following combination of features:

Key facilities

- one or more keys per room can be issued from a small and convenient key console or from the control computer.
 - any key can be assigned to open multiple rooms at the time of first issue or any time later.
-

- the first room key issued to the client also opens the safe for a normal key issue, although any room key or a special key can be assigned to open the safe if preferred by the client.
- the room key can provide access to other facilities such as lifts to VIP floors or leisure facilities.
- keys can be assigned in advance to pre-register clients, for example tour groups. A preassigned key automatically becomes active and replaces previous keys the first time it is inserted into the lock.
- a PMS communication link simplifies operation by integrating key issue with check-in, check-out and room moves in a single person operation, and permits event reports to include client names.

Staff key and master key facilities

- There are no limitations to the number of keys and locks that can be handled by the system.
- Comprehensive master suiting permits any key to be assigned to open any combination of locks, restricted to specific time periods for each lock if required. Thus there is no limit to the number of master levels available, and to the access permissions granted to each master level, from Grand Master down to a single door.

Maintenance keys

- one shot keys can be issued, which can open assigned locks over a specified time period. A one-shot key can open each lock once only.

Emergency keys

- emergency keys are like master keys, with the additional facility that they override a shotbolt from outside the room.

Battery keys

- battery keys contain a power source that can open a lock when all power to the lock, including battery back up power, is lost. A battery key will not open a lock that has power, either mains or battery back up power. A battery key will override a shotbolt.

Housekeeping keys

- housekeeping keys are master keys issued to housekeeping staff, typically to open all rooms on a floor during a specified time period.
- additional rooms on other floors can be assigned to a housekeeping key, for example to permit a maid to cover an additional workload.
- specific housekeeping keys are used to signal room status 'cleaned' and 'inspected' from the room to the PMS

In addition to providing these facilities the system can provide the following records:

Audit trails

- comprehensive audit trails of all key issues, key assignment changes (such as rooms added to a housekeeping key), and key usage are recorded by the system
- event logs showing selected activity can be printed or displayed on screen. Selected activities can be for example: all accesses to a selected room, all attempted accesses with a particular key whether successful or not, all invalid access attempts, all alarms, key issues by a particular operator
- fast print out of staff on duty and last key access can be generated as part of an emergency evacuation procedure
- report generation facilities based on the audit trails provide for a wide range of management reports and summary information
- customised event logs and report formats can be provided or can be created by the client using the underlying report generation and word processing facilities.

CLAIMS

1. An electronic key for actuating a release device, wherein the body of the key incorporates an electronic chip which, on activation, is capable of transmitting a stream of digital data through a two wire contact connected to a control circuit in order to release or activate the device.
 2. A key according to Claim 1, wherein the key body has a handle portion and an elongate shank portion, and the chip is mounted in the handle portion.
 3. A key according to Claim 2, wherein the chip is mounted in a plastics carrier which is received in a hole in the thickness of the handle.
 4. A key according to Claims 2 or 3, wherein the shank has two spaced apart contact zones to make electrical contact with contacts in the release device, which contacts are incorporated in a control circuit.
 5. A key according to any preceding Claim, wherein a portion of the shank is shaped to engage a shotbolt.
 6. A key reader for use with a key according to any preceding Claim, comprising a keyway to receive the shank of the key and two contacts to make electrical contact with the contacts of the key.
 7. A key reader according to Claim 6, incorporated in a control circuit arranged to authorise a key and to record use of the key and/or the reader.
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8. A key reader according to Claim 6 or 7, including a socket shaped to receive a shotbolt.
9. A key reader according to any of Claims 6 to 8, including a battery key pass facility to allow actuation of the received key in the event of a power failure.

Relevant Technical Fields

- (i) UK Cl (Ed.N) E2A (AEE, ALV)
(ii) Int Cl (Ed.6) E05B (19/00, 19/04, 49/00)

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: EDOC, WPI

Search Examiner
P J SILVIE

Date of completion of Search
13 SEPTEMBER 1995

Documents considered relevant
following a search in respect of
Claims :-
ALL

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Category	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2190700 A ✓ (TODD) whole document	1 to 4, 6, 7 at least
X	GB 2155988 A ✓ (BAUER KABA) whole document	1 to 6, 7 at least
X	GB 1337233 A (EASTERN) whole document	1, 2, 4 to 8 at least
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X	EP 0253499 A2 (SCHLUMBERGER) whole document	1, 2, 4, 6, 7 at least
X	WO 92/15177 A1 ✓ (DATAKEY) whole document	1, 6, 7 at least
X	US 5170431 A (MAS-HAMILTON) see Figure 1	1, 2, 4, 6, 7 at least

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